

DIGITAL CAMERA APPARATUS

BACKGROUND OF THE INVENTION

5 Field of the Invention

The present invention relates to a digital camera apparatus, for example, a PDA (Personal Digital Assistant) with a digital camera, a palmtop PC (Personal Computer) with a digital camera function, a laptop PC with a digital camera function and a telephone with a digital
10 camera function and the like.

Description of the Prior Art

In a digital camera, because of a fact that it can be used conveniently, many images are photographed frequently. However, it is
15 also a fact that processes for arranging and classifying the photographed images after photographing become cumbersome. As a solution to this cumbersomeness, there has been developed a digital camera which associates a TEXT or a voice with the image and carries out automatic process by a personal computer or a server. In such digital camera, a
20 method of downloading a list previously created on the personal computer to the digital camera and associating the image by means of selecting a name of item of the created list at the time of photographing, or a method of downloading a content created by a software keyboard using touch panels to a Exif (Exchangeable image file format) file at the
25 time of photographing, have been performed.

In addition, although there is cumbersomeness of inputting by the software keyboard, such a method in which standard phrases are

stored to an external memory or to an internal memory beforehand, and can be easily selected by operation of touch panels or keystrokes, has also been performed.

Furthermore, for business use, there has been a demand for
5 recognizing a printed code such as a bar code used for product identification and adding information to the photographed image by associating the photographed image with the printed code.

As a typical example for the prior art, there is an image recognition system which displays a display frame used for a guide on
10 the personal computer and the like by providing a camera as an inputting device, and processes the recognition on the personal computer and the like after scanning the image (for example, see Japanese Patent Laid Open No. H9 - 185695). Also, there is a reading device which photographs the image and then performs the process of recognition (for
15 example, see Japanese Patent Laid Open No. H9 - 114913).

However, in conventional digital cameras including the above mentioned prior arts, there has not been existed such a digital camera which recognizes a code which corresponds to an object during a series of photographing operation, and determines the recognition similar to
20 determination of the photographing operation after displaying a result of the recognition. Accordingly, such a digital camera which is capable of photographing the object after unfailingly recognizing the code which corresponds to the object, and unmistakably carrying out the association between the printed code and the image of photograph, is called for.

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SUMMARY OF THE INVENTION

Therefore, an object of the present invention is to provide a digital camera apparatus capable of easily scanning an identification code by directly associating the identification code with an Exif file of an image of photograph or associating the identification code with the Exif file of the image of photograph after converting the identification code to corresponding information, by means of a main body of the digital camera having a function for recognizing the printed code such as a bar code.

To accomplish the above mentioned object, a digital camera apparatus relating to a first aspect of the present invention comprises an image inputting device for inputting an image to be photographed; an image processing device for carrying out a processing of the image inputted by the image inputting device; a recognizing device which automatically recognizes a printed code included in the image; a displaying device for displaying a result of the recognition of the recognizing device; and a recording device for recording data of the recognition automatically recognized by the recognizing device. In addition, the recognizing device automatically recognizes the printed code of the image scanned by triggering a first release by the image inputting device before determining and recording the image in a second release by the image inputting device.

A digital camera apparatus relating to a second aspect of the present invention comprises a guide displaying device which displays a most appropriate guide for recognizing a printed code; an image inputting device for inputting an image to be photographed; an image processing device which carries out a processing of the image inputted by the image inputting device; a recognizing device which automatically

recognizes the printed code included in the image; a displaying device for displaying a result of the recognition of the recognizing device; and a recording device for recording data of the recognition automatically recognized by the recognizing device. In addition, the printed code is
5 automatically recognized by adapting the printed code to the most appropriate guide displayed by the guide displaying device.

A digital camera apparatus relating to a third aspect of the present invention comprises an image inputting device for inputting an image to be photographed; an image processing device which carries out
10 a processing of the image inputted by the image inputting device; a recognizing device which automatically recognizes a printed code included in the image; a displaying device for displaying a result of the recognition of the recognizing device; a recording device for recording data of the recognition automatically recognized by the recognizing
15 device; a code setting device for setting a kind of the printed code to be automatically recognized; a guide displaying device which displays a most appropriate guide for recognizing the printed code in accordance with a content set by the code setting device; and a resolution setting device for setting a resolution of the image which is scanned. In
20 addition, the printed code is automatically recognized pursuant to the displaying of the guide corresponding to the content set by the code setting device and to the resolution of the image set by the resolution setting device.

A digital camera apparatus relating to a fourth aspect of the
25 present invention comprises an image inputting device for inputting an image to be photographed; an image processing device which carries out a processing of the image inputted by the image inputting device; a

recognizing device which automatically recognizes a printed code included in the image; a displaying device for displaying a result of the recognition of the recognizing device; a recording device for recording data of the recognition automatically recognized by the recognizing
5 device; a code setting device for setting a kind of the printed code to be automatically recognized; and a guide displaying device which displays a most appropriate guide for recognizing the printed code in accordance with a content set by the code setting device. In addition, a switching over of photographing modes is automatically carried out corresponding
10 to the most appropriate guide displayed by the guide displaying device.

In one embodiment, the above mentioned code setting device sets start/stop codes and a kind of bars as the content of the setting thereof.

Also, the above mentioned guide displaying device shows a minimum size necessary for carrying out the recognition to an user as a
15 guide display.

Furthermore, a transverse width of the minimum size of the guide display is decided from a minimum line width of a bar code.

A digital camera apparatus relating to a fifth aspect of the present invention comprises an image inputting device for inputting an
20 image to be photographed; an image processing device which carries out a processing of the image inputted by the image inputting device; a recognizing device which automatically recognizes a printed code included in the image; a displaying device for displaying a result of the recognition of the recognizing device; a recording device for recording
25 data of the recognition automatically recognized by the recognizing device; and an information searching device which defines an information file where information corresponding to the printed code is

included therein to an external memory and an internal memory
beforehand, and searches the corresponding information after the
printed code is recognized. In addition, an adding of information is
carried out by converting the printed code to information corresponding
5 to the printed code.

Also, a result of the recognition of the above mentioned printed
code makes it possible to be notified by a playback of voice.

Furthermore, a bar code for identification in commercial use is
included in the above mentioned printed code.

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BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a block diagram showing a basic structure of a digital
camera apparatus relating to the present invention.

15 Fig. 2 is a block diagram showing a structure of an inner circuit
of a digital camera which is an embodiment of the present invention.

Fig. 3 is a flowchart showing a processing operation relating to a
first embodiment of the present invention.

Fig. 4 is an image diagram showing one example of a screen
20 representing a selection relating to the first embodiment of the present
invention.

Fig. 5 is a diagram showing a decided example of a displaying of
a guide relating to the first embodiment of the present invention.

Fig. 6 is a flowchart showing a processing operation relating to a
25 second embodiment of the present invention.

Fig. 7 is a flowchart showing a processing operation relating to a
third embodiment of the present invention.

Fig. 8 is a flowchart showing a processing operation relating to a fourth embodiment of the present invention.

Fig. 9A is a diagram showing one example of a file system of an external memory or an internal memory.

5 Fig. 9B is a diagram showing one example of the file system of the external memory or the internal memory.

Fig. 10 is a flowchart showing a processing operation relating to a fifth embodiment of the present invention.

10 Fig. 11A is an explanatory diagram showing an example of information storing to an Exif file.

Fig. 11B is an explanatory diagram showing an example of the information storing to the Exif file.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

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Hereinafter, some of embodiments of a digital camera apparatus relating to the present invention will be described in detail with reference to the accompanying drawings.

20 In Fig. 1, there is shown an example of a typical basic structure of the digital camera apparatus.

An inputted image is converted into an electrical signal by an imaging device CCD (201), and the electrical signal is inputted to a digital signal processing section (204) after converted into a digital signal by an A-D converter having 8 bits (256 gradation sequence)-12
25 bits (4096 gradation sequence) (202).

Main processes carried out in the digital signal processing section are (1). a photometry calculation necessary for auto focusing (AF),

automatic exposure control (AE) and auto white balance (AWB), (2). a signal processing of brightness and color for enhancing resolution and color reproducibility, and (3). data compression and decompression necessary for recording and playing of image data.

5 The data encoded and compressed (205) is to be written in a recording media 6 (206). The playing of the recorded data is outputted as a video signal for a V monitor after decompressed and converted into raster data (203).

10 Next, an example of a block diagram of an inner circuit of a digital camera in the digital camera apparatus of the present invention will be shown in Fig. 2.

 In the example shown in Fig. 2, when the digital camera is in a code recognition mode, a most appropriate guide is calculated by a CPU 8 according to a content of setting of a F-ROM for data 13, and the
15 calculated guide is outputted to a displaying device 7 such as a LCD and the like. Scanning of an image is carried out after triggering a first release (half pressing down) as well as the photographing process such as the AF and AE and the like are performed, and the image is uncompressed in a work memory 14, and is processed with a code
20 recognition process by the CPU 8. A result of the code recognition process is outputted to the displaying device 7, and is determined when a second release (full pressing down) is carried out, and recorded in the F-ROM for data 13. A conversion process from the code to information is searched within a corresponding file between the code and the
25 information previously stored in an external memory 16 or in an internal memory, and this search result is outputted to the LCD through a control section of the displaying device 7. Later, the search result is stored in

the external memory 16 by adding the stored code or the information data to the Exif file created by the photographing.

Reference numeral 15 denotes a memory control. The code recognition process, data transmission process with the external memory 16, the searching of corresponding file, the conversion process and the information adding process to the Exif file are executed by program written in a ROM 12.

Meanwhile, reference numeral 9 denotes a bus arbiter, reference numeral 10 is an A-D conversion for a mike input, reference numeral 11 is a touch panel, and reference numeral 17 denotes a PC I/F control.

Next, a series of processing flow in a first embodiment of the present invention will be described with reference to Fig. 3.

First of all, in the digital camera of the present invention, the first release (half pressing down) is carried out (S301), and normal photographing processes such as the auto focus, the auto exposure control and the auto white balance are performed (S302). After the photographing processes are performed, a judgment in the code recognition mode is carried out (S303). At this time, when the code recognition mode is not set (S303/NO), the second release (full pressing down) is carried out (S307).

When the code recognition mode is set (S303/YES), a scanning process of the image is carried out with a predetermined resolution (S304). Then, the code recognition process is carried out with the image uncompressed in a workflow by the CPU 8 (S305). Additionally, the result of the code recognition is outputted to the displaying device such as the LCD (S306).

Subsequently, after the second release (full pressing down) is

performed (S307), the judgment in the code recognition mode is carried out (S308). At this time, when the code recognition mode is not set (S308/NO), a normal photographing process is performed (S310). When the code recognition mode is set (S308/YES), data of the recognition is recorded to the F-ROM for data (S309).

As described above, according to the first embodiment of the present invention, it is possible to carry out the automatic recognition of a printed code such as a bar code by a simple operation similarly to a normal photographing operation.

Next, a second embodiment of the present invention will be described.

In the second embodiment, an image of screen of a guide display in the code recognition mode is described with reference to Fig. 4, and a decided example of the guide display is described with reference to Fig.

5.

In an example for the image of screen shown in Fig. 4, at first, a mode displaying 20 is displayed at lower-left side of the screen, and a minimum size which is a size necessary to be able to carry out the recognition is represented by a frame 30, and a comment for promoting photographer's attention is inserted in the frame 30. For example, a comment such as "Please enlarge it so that an object becomes larger than this frame size" may be inserted.

By enlarging the object over the size of the guide frame, the photographer can reduce an error in the recognition.

Now, an example for displaying the guide display displayed from utilizing a minimum line width of the bar code will be described with reference to Fig. 5.

In a case of JAN (Japanese Article Number) code, 1 module (unit for minimum width of bar) is specified as 0.33 millimeter as a basic. Also, it is structured as a total of 88 modules as shown in Fig. 5. If number of dots in an image allotted to recognition of the minimum line width is assumed as 3 dots, it will be $88 \times 3 = 264$ dots. If the image which is to be scanned is in VGA size (640×480), the minimum size can be represented if the guide is displayed on the LCD by that ratio. The number of dots can be decided by power of resolving the 0.33 millimeter. It is also possible to enhance the resolution of the image to be scanned if the resolving power is insufficient.

Next, an example for a series of processing flow in the code recognition mode will be described with referring to Fig. 6.

Firstly, a recognition mode is started by an operation operated by an user (S601). Subsequently, the minimum width of the code to be recognized is calculated (S602). An example of the calculation is as shown in Fig. 5. Then, the guide is displayed in accordance with a result of the calculation (S603).

After the first release (half pressing down) is performed (S604) and the photographing processes are performed (S605), the judgment in the code recognition mode is carried out (S606). At this time, if the code recognition mode is not set (S606/NO), the second release (full pressing down) is carried out (S608). If it is the code recognition mode (S606/YES), the judgment in the recognition mode, scanning of the image and the code recognition process are performed, and the result is displayed (S607).

In addition, after the second release (full pressing down) is performed (S608), the judgment in the code recognition mode is carried

out (S609). At this time, if the code recognition mode is not set (S609/NO), the normal photographing process is performed (S611). If it is the code recognition mode (S610/YES), the data of the recognition is recorded to the F-ROM for data (S610).

5 As described above, according to the second embodiment, the error in the recognition can be reduced by carrying out the most appropriate guide display in the code recognition and following this guide display.

10 Next, a third embodiment of the present invention will be described.

 As an instance, there are various kinds of printed codes even the bar code is exemplified. It ranges from the simple ones such as NW-7 developed in relatively early stage by Monarch Marking Ltd in 1972, Alphanumeric and CODE-39 in which seven kinds of symbols are coded
15 which are developed by Intermec Corp. in 1975, to CODE-128 in which 128 characters in Full ASCII are symbolized developed by Computer Identics Corp. in 1981. A point of whether or not the automatic recognition can be carried out with the image among them depends on whether the recognition for a narrowest white bar and a narrowest black
20 bar can be done or not.

 In the third embodiment, by setting kinds of printed codes which are to be recognized in a set-up mode previously, the error in the recognition can be reduced, for example, by judging whether or not the narrowest white and black bars can be recognized from start/stop codes
25 in the code which is to be recognized or from characteristic in kinds of bars and then previously setting the resolution of the image to be scanned corresponding to that judgment, or performing changing over

operation based on a result in reading.

Next, an example for a series of processing flow in the third embodiment of the present invention will be described with referring to Fig. 7.

5 First of all, the recognition mode is started by the operation of the user (S701). Subsequently, the guide is displayed corresponding to the content of setting of the kinds of codes. In a case when the kinds of codes are cannot be decided from a reason such as variable length, the guide is displayed with a temporal size (S702).

10 Subsequently, the first release (half pressing down) is performed (S703), and the normal photographing processes such as the auto focus, the auto exposure control and the auto white balance are carried out (S704).

After the photographing processes are performed (S704), the judgment in the code recognition mode is carried out (S705). At this time, if the code recognition mode is not set (S705/NO), the second release (full pressing down) is performed (S712).

If it is the code recognition mode (S705/YES), the scanning of the image is carried out with the resolution decided by the setting of the content of the kinds of codes (S706). Then, find the narrowest white and black bars in accordance with the kinds of codes and judge whether the resolving is possible or not (S707). If the resolving is impossible to be carried out (S708/NO), the resolution of the scanned image is enhanced (S710) and returned to S706.

25 If the resolving is possible to be carried out (S708/YES), the code recognition process (S709) and the process of displaying the result (S711) are performed. Operations after the performing of the second release

(full pressing down) (S712) are similar to the operations after S308 in Fig. 3.

As described above, according to the third embodiment of the present invention, by displaying the guide display which corresponds to the kinds of the codes and by setting the resolution of the image to be scanned and adapting the processes to that setting, the error in the recognition can be reduced.

Next, a fourth embodiment of the present invention will be described.

10 In this fourth embodiment, a setting of photographing is automatically changed over in accordance with the kinds of codes which have been set when the digital camera is entered to the code recognition mode. An example of a processing flow of the changing over process will be described with reference to Fig. 8.

15 First of all, the recognition mode is started by the operation of the user (S801). Next, the setting of photographing is automatically changed over to a macro-mode so as to be able to carry out focusing to the object near to the digital camera easily (S802). Then, the guide is displayed with the calculation result in accordance with the setting of the kinds of codes (S803).

From then on, for a setting of mode, the first release (half pressing down) is carried out (S804), and the judgment in the code recognition mode is performed (S805). At this time, when the code recognition mode is not set (S805/NO), the normal photographing processes are performed in the first release (S807), and the second release is pressed down (S809). When the code recognition mode is set (S805/YES), the judgment in the recognition mode is performed, the

image is scanned, the code recognition process is processed and the displaying of the result is displayed (S808) after most appropriate processes for the recognition of the printed code are performed (S806), and then the second release is pressed down (S809).

5 Further, after the second release (full pressing down) is carried out (S809), the judgment in the code recognition mode is performed (S810). At this time, if the code recognition mode is not set (S810/NO), the normal photographing process is processed (S812). When the code recognition mode is set (S810/YES), the data of the recognition is
10 recorded to the F-ROM for data (S811).

As described above, the example for creating a most appropriate photographing circumstance is described in Fig. 8, by means of automatically setting to the macro-mode and changing to an exposure which is not influenced by gloss of a printed material. Therefore,
15 according to the fourth embodiment of the present invention, it is possible to carry out the code recognition with reduced error in the recognition easily by automatically changing over the setting of photographing in the code recognition mode.

By the way, a file system within a memory of the digital camera
20 is structured pursuant to DCF (Design rule for Camera File system).

The DCF is a standard of a file system in a digital still camera established by Japan Electric Industry Development Association (JEIDA) in January, 1999.

In addition, an information file defines a TEMPLATE folder, and
25 is stored to that TEMPLATE folder with the same layer of a Digital Camera Images (DCIM) directory where a record file is stored therein to. The information file is stored in a format corresponding to number of

items of information such as in a format classified by a name of file. The corresponding file of the code and the information in the present invention is also kept to be stored, for example, in the TEMPLATE folder.

5 Here, examples for the file system and the definition of the corresponding file will be described with reference to Figs. 9A and 9B.

 The information file is to be stored under a TEMPLATE directory as CMEMOx. TXT as shown in Fig. 9A. The corresponding file (CODECH. TEXT) of the code and the information of the present
10 invention is also stored, for example, under the TEMPLATE directory. An example for the definition of the CODECH. TXT file is shown in Fig. 9B.

 Portions shown by two slashes in the drawing of Fig. 9B are ignored regarded as lines for comments.

15 Next, a fifth embodiment of the present invention will be described.

 In the fifth embodiment, the searching for the corresponding file within the TEMPLATE folder is carried out at the time when the first release (half pressing down) is triggered and recognized the printed code,
20 and outputting of the information corresponding to the code is carried out outputted as the result of the searching on the displaying device such as the LCD. When the code recognition is determined by the second release (full pressing down), the code and the information corresponds to the code are recorded to the F-ROM for data.

25 Now, an example of a series of processing flow in the fifth embodiment will explained with reference to Fig. 10.

 Firstly, the recognition mode is started by the operation of the

user (S1001). Subsequently, the guide is displayed with the result of the calculation in accordance with the setting of the kinds of codes (S1002).

Thereafter, the first release (half pressing down) is performed by
5 being pressed to carry out the setting of mode (S1003), and the judgment in the code recognition mode is carried out (S1004). At this time, when the code recognition mode is not set (S1004/NO), the normal photographing processes are performed by the pressing down of the first release (S1006), and the second release is pressed down (S1008). When
10 it is the code recognition mode (S1004/YES), the judgment in the code recognition mode is performed, the image is scanned, the process of the code recognition mode is processed and the displaying of the result is displayed (S1005). Then, if the corresponding file of the code and the information exists under the TEMPLATE directory, the searching for the
15 corresponding file within the TEMPLATE folder is performed, and the result of that searching is displayed (S1007). Subsequently, the second release is pressed down (S1008).

In addition, after the second release (full pressing down) is performed (S1008), the judgment in the code recognition mode is carried
20 out (S1009). At this time, if the code recognition mode is not set (S1009/NO), the normal photographing process (S1011) is performed. When it is the code recognition mode (S1009/YES), the data of the recognition is recorded to the F-ROM for data (S1010).

The code and the information recorded in such a way as in the
25 example shown in Fig. 10 are later recorded to the Exif file of the photographed image as the additional information to the image. A recording file which becomes as a DCF object is stored into the DCF

directory in the example shown in Fig. 9A, for instance, into "100RICOH". The recording file is created in accordance with an Exif format.

Meanwhile, the Exif is a format standard for image files in the digital still camera stipulated by the Japan Electric Industry Development Association (JEIDA) in October, 1995. In the recording file which is in the Exif format, areas for writing main images and thumbnail images are regulated.

Now, an example of which the recorded code and the information have been stored to the Exif as data for the additional information to the photographed image will be described with referring to Figs. 11A and 11B.

As shown in Fig. 11A, the storing of the recorded code and the information to the Exif file is carried out with a format shown therein. Also, both of the code and the information can be stored into the Exif file as shown in Fig. 11B.

As described above, example of storing the recorded code and the information into "User Comment Tag" is described in the example shown in Fig. 11A. According to the fifth embodiment of the present invention, the additional information can be made easier to be understood, by converting the recognition code to information.

According to the present invention as described above, it is possible to automatically recognize the printed code such as the bar code easily by carrying out the similar operation similar to the normal photographing operation.

Also, it is possible to scan the data of the code by the simple operation of following the displaying on the display without causing the

error in the recognition.

In addition, the error in the recognition can be avoided even more by displaying the most appropriate guide on the display in accordance with the printed code.

5 Moreover, the error in the recognition can also be avoided by the fact that the switching over to the most appropriate setting can be carried out easily, and since code setting means sets the start/stop codes and the kinds of bars as the content of the setting, the judgment of whether or not the recognition for the narrowest white and black bars of
10 the bar code can be performed, as a result, the automatic recognition of the printed code can be achieved.

 Also, because guide displaying means displays the minimum size which is a size necessary to be able to carry out the recognition to the user as the guide display, the user can enlarge the image to be
15 photographed more than the minimum size, thereby the error in the recognition can be reduced.

 In addition, since the guide displaying means decides a transverse width of the guide display from utilizing the minimum line width of the bar code, the minimum size for the recognition can be
20 represented by the frame.

 Furthermore, according to the present invention, it is possible to convert the printed code automatically to the easily understandable information which corresponds to the printed code.

 Also, because a notification of the result of the recognition for the
25 printed code can be performed by playback of voice, user-friendliness in the structure can be made, and since the printed code described in the present invention includes a bar code for identification in a commercial

use, it is possible to recognize generally used bar codes.